Catalogue no. 82-003-X
ISSN 1209-1367

Health Reports

Cycling in Canada

by Pamela L. Ramage-Morin

Release date: April 19, 2017

Statistics Canada Statistique Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

email at STATCAN.infostats-infostats.STATCAN@canada.ca

telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-514-283-9350

Depository Services Program

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "Standards of service to the public."

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Standard table symbols

The following symbols are used in Statistics Canada publications:

. not available for any reference period
.. not available for a specific reference period
... not applicable
0 true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2017

All rights reserved. Use of this publication is governed by the Statistics Canada Open Licence Agreement.

An HTML version **is also available.**

Cette publication est aussi disponible en français.

Cycling in Canada

by Pamela L. Ramage-Morin

Abstract: This article provides an overview of cycling, including fatalities and bicycle helmet use, based on data from the 1994/1995 National Population Health Survey, the 2013/2014 Canadian Community Health Survey and the Vital Statistics–Death Database. In 2013/2014, an estimated 7.0 million Canadians aged 12 or older (24%) reported cycling in the past three months, compared with 6.5 million (29%) in 1994/1995. The prevalence of cycling declined with age, and was more common among males and people living in higher-income and -education households. From 1994 through 2012, 1,408 cyclists were killed, an average of 74 annually, most of whom were male (84%). In 2013/2014, 45% of those who had cycled in the past three months reported that they always wore a helmet.

Keywords: Cyclists, fatalities, head protective devices, health surveys, helmet use, mortality, population-based, prevalence, vital statistics

The health benefits of physical activity, including cycling, are widely recognized.[1-3] In an era when nearly a third of children and youth and just under two-thirds of adults are overweight or obese,[4,5] cycling for leisure or transport is a valuable form of exercise. Cycling is also good for the environment—commuting by bicycle helps to alleviate road congestion and noise pollution and reduces emissions.[1,3]

But while the benefits of cycling are acknowledged, so are the dangers. Cyclists are vulnerable in the event of a crash. Strategies to protect cyclists include infrastructure such as bicycle paths, dedicated bike lanes and traffic calming; side guards for heavy trucks; driver behaviour, with an emphasis on sharing the road; and cyclist behaviour, including increased visibility and helmet use.[6-10] The last has been debated extensively. Some resist legislated helmet use, at least for adults, on the grounds that helmets offer minimal protection and encourage risk-taking, and that such legislation impinges on personal freedom and reduces ridership; others dispute these claims.[9,11-15] Medical, public health and other sectors recommend that all-age helmet use be legislated and enforced across Canada.[16-20]

This analysis examines bicycle and helmet use among people aged 12 or older in 1994/1995 and in 2013/2014, and cycling fatalities during the 1994-to-2012 period. Other behaviours of helmet users and non-users are compared, specifically, seatbelt use, smoking, flu shots and drinking.

Characteristics of cyclists

In 2013/2014, an estimated 12 million Canadians (41%) aged 12 or older reported that they had cycled in the previous year (Table 1). Cycling was more common at younger ages—82% among 12- to 14-year-olds versus 27% by age 50 or older—and among people in higher-education and -income households. The association with education and income may reflect residence in neighbourhoods characterized by bicycle paths, traffic-calming measures and lower perceived levels of crime, and workplaces with facilities (for example, bike racks) and policies such as flexible work hours that enable active commuting.[21-23]

Males were more likely than females to have cycled in the past year regardless of age, income or education. Males residing in population centres were more likely than those in rural areas to cycle; the opposite was true for females, who were more likely than males to report excessive traffic as a barrier to cycling.[24]

Cycling was more common in Quebec (48%) and Manitoba (46%) than in the rest of Canada. It was less common in the Atlantic Provinces (from 18% in Newfoundland and Labrador to 32% in New Brunswick), Saskatchewan and Ontario (both 38%), and Nunavut (23%).

Comparison with 1994/1995

In 2013/2014, an estimated 7.0 million people reported that they had cycled in the past 3 months, up from 6.5 million in 1994/1995. Despite this increase, cyclists comprised a diminishing percentage of the population: 24% in 2013/2014 versus 29% in 1994/1995 (Figure 1). Even when the aging population was taken into account, the decrease persisted; if the age structure had remained unchanged during the two decades, an estimated 25% of the population would have reported cycling in 2013/2014.

The decrease in cycling was evident in most age groups. Other activities may have compensated for this apparent reduction in physical activity. For example, the percentage of the population who reported running or jogging in the past 3 months almost doubled from 14% (95% CI: 14 to 15) in 1994/1995 to 27% (95% CI: 26 to 27) in 2013/2014; increases were evident in every age group.

The decline in cycling raises safety concerns, because areas where cycling is more prevalent tend to have lower rates of bicycle-related collisions and fatalities—a "safety in numbers" effect.[3,25] Teschke et al.[26] found an association between higher "mode share" (percentage of commuters using bicycles) and fewer traffic-related injuries.

Author: Pamela L. Ramage-Morin (Pamela.Ramage-Morin@canada.ca) is with the Health Analysis Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

Table 1
Percentage who reported cycling in past 12 months, by sex and selected characteristics, household population aged 12 or older, Canada, 2013/2014

	Both sexes			Males			Females		
		95% confidence interval			95% confidence interval			95% confidence interval	
Characteristic	%	from	to	%	from	to	%	from	to
Total	40.5	40.0	41.0	47.0	46.3	47.7	34.2†	33.6	34.9
Age group									
12 to 14	81.5	79.8	83.1	86.0	83.8	88.0	77.3†	74.6	79.7
15 to 17	69.8*	67.9	71.7	77.9*	75.3	80.2	60.7*†	57.7	63.5
18 to 24	52.1*	50.5	53.6	56.7*	54.4	58.9	47.2*†	45.0	49.3
25 to 49	44.9*	43.9	45.8	50.2*	48.8	51.6	39.5*†	38.3	40.8
50 or older	26.9*	26.2	27.5	34.1*	33.1	35.1	20.3*†	19.5	21.1
Household education									
Less than postsecondary graduation ‡	28.6	27.6	29.6	36.0	34.5	37.6	21.9†	20.8	23.1
Postsecondary graduation	44.1*	43.5	44.7	50.1*	49.3	51.0	38.2*†	37.5	39.0
Household income quintile									
Lowest	31.4	30.3	32.6	41.1	39.1	43.1	24.2†	22.9	25.6
Lower-middle	34.1*	33.0	35.2	40.6	38.8	42.4	28.4*†	27.1	29.8
Middle	41.1*	40.0	42.2	46.5*	44.8	48.1	35.9*†	34.4	37.4
Upper-middle	46.1*	45.1	47.2	50.9*	49.3	52.4	41.0*†	39.6	42.5
Upper	49.7*	48.7	50.8	53.8*	52.3	55.3	44.6*†	43.1	46.1
Province/Territory									
Newfoundland and Labrador	18.4*	16.7	20.3	23.2*	20.3	26.3	13.9*†	12.1	15.9
Prince Edward Island	29.1*	26.5	31.7	33.9*	30.0	38.0	24.6*†	21.6	27.9
Nova Scotia	26.8*	24.9	28.7	32.6*	29.8	35.5	21.4*†	19.4	23.6
New Brunswick	32.0*	30.2	33.9	40.8*	37.8	43.8	23.9*†	21.8	26.1
Quebec	47.8*	46.8	48.9	54.5*	53.0	56.0	41.4*†	39.9	42.9
Ontario	38.4*	37.5	39.3	44.8*	43.5	46.2	32.3*†	31.2	33.4
Manitoba	46.1*	44.1	48.0	55.3*	52.3	58.3	37.1*†	34.6	39.6
Saskatchewan	38.1*	36.4	39.8	42.8*	40.3	45.4	33.4†	30.9	35.9
Alberta	40.3	38.9	41.9	45.8	43.7	48.0	34.7†	32.7	36.8
British Columbia	40.2	39.0	41.5	47.1	45.2	49.0	33.6†	31.9	35.3
Yukon	42.0	39.0	45.0	42.7	37.7	47.9	41.2*	35.8	46.8
Northwest Territories	43.6	38.9	48.5	49.2	42.9	55.6	37.8†	32.5	43.4
Nunavut	23.4*	19.9	27.2	30.3*	25.2	35.9	15.9*†	13.1	19.3
Urban/Rural									
Population centre	40.5	40.0	41.1	47.5*	46.7	48.3	33.8*†	33.1	34.6
Rural‡	40.4	39.5	41.4	44.9	43.6	46.2	35.9†	34.7	37.2

* significantly different from reference category/preceding age group/preceding household income quintile/rest of Canada (for provinces/territories) ($p < 0.05$)
† significantly different from males ($p < 0.05$)
‡ reference category
Source: 2013/2014 Canadian Community Health Survey.

Deaths

From 1994 through 2012, 1,408 cyclists died in crashes, an average of 74 each year (Figure 2). Millar[27] reported 1,665 cyclist deaths between 1980 and 1994, an average of 111 annually. At that time, 57% of cyclist deaths involved people younger than age 20,[27] compared with 30% of the more recent deaths. Most of those killed were male—around 80% in the earlier period[27] and 84% in 1994 through 2012.

The fatality rate for cyclists was 2.6 deaths per million population in 2012. This was lower than rates for pedestrians and motor vehicle occupants—9.0 and 43.0 deaths per million population, respectively.[28] Annual cycling fatality rates fluctuated during the 1994-to-2012 period, from a low of 1.6 deaths per million population (2003) to a high of 2.9 deaths per million population (1994), but remained below rates in the 1980s, which ranged from 3.0 to 4.5 per million population.

While useful for comparisons, rates based on the entire population are not indicative of the risk specific to cyclists. Based on the number of person-trips by mode of travel, Beck et al.[29] reported fatality rates for cyclists, pedestrians and motor vehicle occupants at 21.0, 13.2 and 9.2 per 100 million person-trips, respectively.

Cycling deaths can be prevented, according to the Ontario Office of the Chief Coroner[6] after a detailed review of deaths from 2006 through 2010. In addition to recommendations for improved road infrastructure, side guards for heavy trucks, legislation and enforcement of road safety laws, mandatory helmet use was proposed, a position supported by medical professionals and other interest groups.[17-20] It has been argued that cyclists of all ages require head protection, and that compliance is higher among younger riders when they observe adult cyclists wearing helmets.[30]

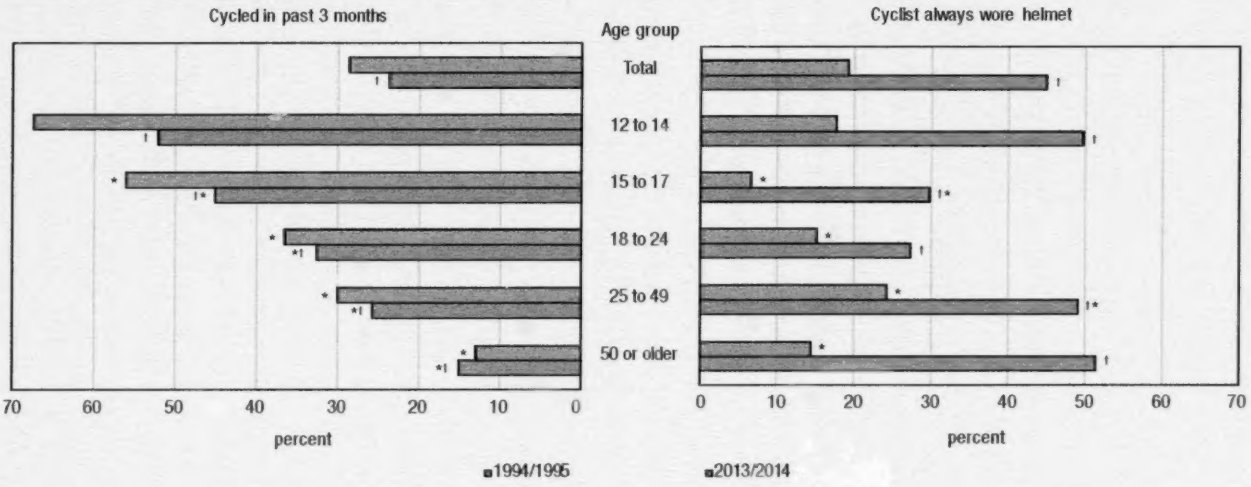
Helmet use

In 2013/2014, of the estimated 12 million cyclists aged 12 or older, 5 million (42%) reported "always" wearing a helmet (users); the remaining 7 million did so "most of the time," "rarely" or "never" (non-users) (Table 2).

Although females were less likely than males to cycle, they were more likely to wear a helmet—46% compared with 39%. Higher helmet use (47%) in the early teen years coincided with the ages when cycling prevalence was highest. These are also the years when parents and caregivers may find it easier to enforce helmet use, which is legislated in several provinces, territories and cities.[26] However, in the later teen (15 to 17) and early adult (18 to 24) years, helmet use dropped to 28% and 25%, respectively. At older ages, the percentage rose again—49% of cyclists aged 50 or older "always" wore a helmet.

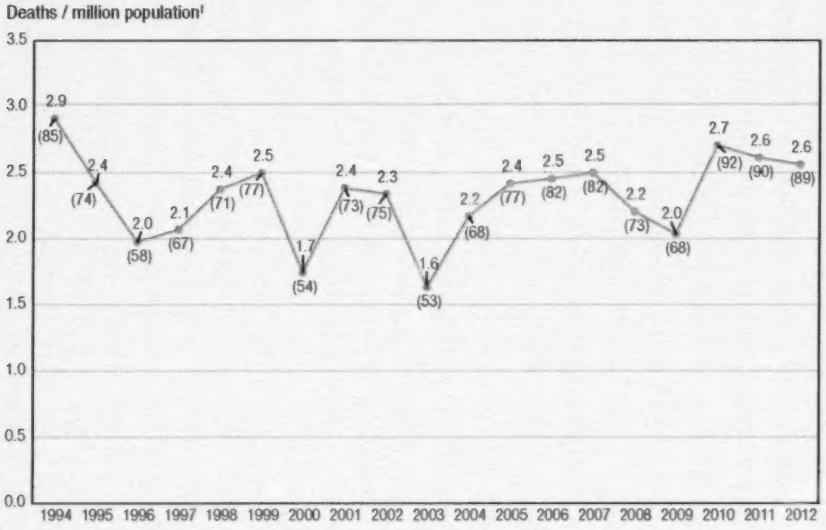
Twenty years ago, helmet use was much less common. In 1994/1995, 19% of those who had cycled in the past 3 months "always" wore a helmet, compared with 45% in 2013/2014 (Figure 1). The increase among 12- to 14-year-olds was almost threefold—from 18% to 50%—which may reflect, at least in part, introduction of bicycle helmet legislation.[31]

Figure 1
Percentage who cycled and bicycle helmet use in past 3 months, by age group, household population aged 12 or older, Canada excluding territories, 1994/1995 and 2013/2014



* significantly different from preceding age group in same year ($p < 0.05$)
† significantly different from 1994/1995 for same age group ($p < 0.05$)
Sources: 1994/1995 National Population Health Survey; 2013/2014 Canadian Community Health Survey.

Figure 2
Cyclist fatality rate and number of cyclist deaths, by year, all ages, Canada, 1994 to 2012



† age-standardized to 2012 Canadian population
Note: Numbers in parentheses indicate number of cyclist deaths.
Sources: 1994 to 1999: Vital Statistics - Death Database, ICD-9 Deaths, by external cause (E810 to E819 and E820 to E825 with .6 appended; E826.1); 2000 to 2012: Vital Statistics - Death Database, CANSIM Table 102-0540, ICD-10 Deaths, by cause, Chapter XX: External causes of morbidity and mortality (V10 to V19).

People who commuted by bicycle were more likely than leisure-time-only cyclists be helmet users—48% (95% CI: 45 to 51) versus 44% (95% CI: 43 to 46). Even when age and sex were taken into account, the odds of commuters wearing a helmet were higher than the odds for non-commuters (1.3; 95% CI: 1.2 to 1.5). Cyclists who lived in population centres were more likely than those in rural areas to wear helmets, which may reflect concerns about traffic safety and aggressive drivers (Table 2).[24]

Other precautionary behaviours

It has been suggested that people who use protective equipment such as helmets tend to take more risks, a concept known as "risk compensation."[12,32] Alternatively, helmet use may indicate a person who is more cautious, and therefore, less likely to take risks and experience injuries.[33] Data for 2013/2014 support the latter: cyclists who "always" wore a helmet were more likely than other cyclists to always use a seatbelt when driving or as a passenger (90% versus 76%) and to have had a flu shot in the past year (33% versus 20%) (Table 3). Helmet users

Table 2
Percentage who always wore helmet when cycling, by sex and selected characteristics, household population aged 12 or older who reported cycling in past 12 months, Canada, 2013/2014

	Both sexes			Males			Females		
		95% confidence interval			95% confidence interval			95% confidence interval	
Characteristic	%	from	to	%	from	to	%	from	to
Total	42.0	41.2	42.8	39.1	38.1	40.1	45.8†	44.7	47.0
Age group									
12 to 14	47.1	44.7	49.6	46.0	42.9	49.2	48.2	44.6	51.9
15 to 17	27.9*	25.6	30.2	25.5*	22.7	28.6	31.3*†	27.9	35.0
18 to 24	25.3	23.5	27.3	23.1	20.7	25.7	28.2†	25.5	31.1
25 to 49	44.2*	42.9	45.5	39.6*	38.0	41.3	49.9*†	48.1	51.7
50 or older	49.3*	47.8	50.8	47.8*	45.8	49.9	51.6†	49.2	53.9
Household education									
Less than postsecondary graduation‡	26.7	25.1	28.3	24.4	22.3	26.6	30.0†	27.2	33.0
Postsecondary graduation	45.2*	44.3	46.0	42.4*	41.3	43.6	48.7*†	47.4	50.0
Household income quintile									
Lowest	28.4	26.4	30.4	26.0	23.2	29.0	31.4†	28.4	34.5
Lower-middle	37.6*	35.6	39.7	36.2*	33.6	38.9	39.4*	36.4	42.4
Middle	41.3*	39.4	43.2	37.7	35.1	40.3	45.8*†	43.3	48.3
Upper-middle	45.5*	43.8	47.2	41.4*	39.2	43.6	51.0*†	48.7	53.4
Upper	50.8*	49.2	52.5	47.7*	45.5	49.9	55.6*†	53.1	58.1
Province/Territory									
Newfoundland and Labrador	45.9	40.6	51.3	44.9	37.8	52.2	47.5	39.7	55.4
Prince Edward Island	67.4*	61.4	72.9	64.5*	55.9	72.3	71.1*	63.1	78.0
Nova Scotia	64.3*	60.4	68.0	61.7*	56.5	66.7	67.9*	61.7	73.4
New Brunswick	52.5*	49.0	56.0	48.6*	43.9	53.4	58.7*†	53.2	64.0
Quebec	34.5*	33.0	36.1	30.8*	28.8	32.9	39.3*†	37.0	41.6
Ontario	38.2*	36.8	39.6	35.8*	34.0	37.7	41.3*†	39.4	43.2
Manitoba	31.5*	28.5	34.6	30.8*	26.9	35.1	32.5*	28.4	36.7
Saskatchewan	22.0*	19.3	25.0	20.5*	17.1	24.3	24.0*	20.0	28.5
Alberta	48.2*	45.5	50.9	45.4*	41.8	49.1	52.0*†	48.2	55.7
British Columbia	65.3*	63.1	67.6	61.1*	58.0	64.1	71.1*†	68.0	74.0
Yukon	50.5*	45.9	55.1	45.5	39.1	52.0	55.8*†	48.8	62.6
Northwest Territories	31.8*	25.0	39.5	27.6*	20.8	35.7	37.6	28.2	47.9
Nunavut	9.0*‡	5.6	14.3	F	...	...	F	...	...
Urban/Rural									
Population centre	44.1*	43.2	45.0	41.2*	40.0	42.4	48.0*†	46.7	49.4
Rural‡	32.4	30.9	33.9	29.3	27.6	31.2	36.2†	33.9	38.6

... not applicable
‡ use with caution
F too unreliable to be published
* significantly different from reference category/preceding age group/preceding household income quintile/rest of Canada (for provinces/territories) ($p < 0.05$)
† significantly different from males ($p < 0.05$)
‡ reference category
Source: 2013/2014 Canadian Community Health Survey.

were less likely than non-users to smoke (10% versus 21%) or to engage in heavy episodic drinking (17% versus 27%). Associations between helmet use and these other behaviours remained even when age, sex and education were taken into account. The tendency for helmet users to adopt other safety practices was also reported by Bolen et al.,[33] who found that they were more likely than non-users to have a household smoke detector and a fire escape plan, and to use seatbelts.

Conclusion

In 2013/2014 an estimated 41% of Canadians reported that they had cycled in the previous 12 months. Although the number of cyclists increased between 1994/1995 and 2013/2014, the percentage of the population who cycled decreased. Cycling fatalities averaged 74 each year during the study period, and fatality rates fluctuated between 1.6 and 2.9 deaths per million population. Helmet use among past 3-month cyclists more than doubled from 19% to 45% during the two decades, with significant increases in every age group. Helmet users were more likely than non-users to engage in what are generally considered precautionary behaviours. ■

Table 3
Prevalence of and adjusted odds ratios for selected behaviours, by bicycle helmet use, household population aged 12 or older who reported cycling in past 12 months, Canada, 2013/2014

Behaviour and bicycle helmet use	%	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to
Always uses seatbelt						
Always uses helmet	90.0*	88.8	91.1	2.6*	2.2	3.0
Does not always use helmet†	76.3	75.0	77.6	1.0	...	...
Flu shot in past year						
Always uses helmet	32.6*	31.4	33.8	1.8*	1.6	1.9
Does not always use helmet†	19.9	19.1	20.8	1.0	...	...
Current smoker						
Always uses helmet	9.5*	8.8	10.4	0.4*	0.4	0.5
Does not always use helmet†	20.6	19.8	21.5	1.0	...	...
Heavy episodic drinking in past year						
Always uses helmet	16.6*	15.7	17.5	0.5*	0.5	0.6
Does not always use helmet†	26.8	25.8	27.8	1.0	...	...

... not applicable

* significantly different from reference category ($p < 0.05$)

† reference category

Notes: Seatbelt use was optional content on the 2013/2014 Canadian Community Health Survey and was selected by Ontario, Manitoba, Alberta, Yukon and Nunavut. Heavy episodic drinking pertained to respondents aged 18 or older and was 4 (women)/5 (men) or more drinks on one occasion. Odds ratios were adjusted for sex, education, age and age^2 (to account for the non-linear relationship between age and helmet use).

Source: 2013/2014 Canadian Community Health Survey.

The data

This study is based on cross-sectional data from the 1994/1995 National Population Health Survey (NPHS) and the 2013/2014 Canadian Community Health Survey (CCHS). The NPHS covers household residents in all provinces, except people living on Indian reserves, on Canadian forces bases, and in some remote areas. CCHS coverage includes the territories, with exclusions similar to the NPHS. The respective household- and person-level response rates are 88.7% and 96.1% (NPHS), and 75.9% and 87.3% (CCHS). Study samples comprised 17,626 (NPHS) and 128,310 (CCHS) respondents. Death data are from the Vital Statistics–Death Database. Details are available at www.statcan.gc.ca.

Cyclist (past 3- and 12-month) included bicycle use for leisure or transport. *Commuters* had cycled to school or work in the past 3 months versus those who cycled only during leisure time.

Helmet users "always" (versus "most of the time," "rarely" or "never") wore a helmet when cycling.

Education (less than postsecondary graduation or postsecondary graduation) and *income* (quintiles) were estimated at the household level.

Population centres are areas with a population of at least 1,000 and a population density of 400 or more per square kilometre. All areas outside population centres are defined as *rural*.

Seat belt use as a driver or passenger was classified as "always" versus "most of the time," "rarely" or "never." This CCHS 2013/2014 optional content was selected by Ontario, Manitoba, Alberta, Yukon and Nunavut.

Current *smokers* (daily or occasional) were grouped together, distinct from former smokers or those who had never smoked.

Heavy episodic drinking for respondents aged 18 or older was consuming 4 (female)/5 (male) or more drinks on one occasion.

Received a seasonal *flu shot* was classified as "within past year" versus "one year ago or longer" or "never."

Cyclist *deaths* in 2000 through 2012 were identified by codes V10 to V19 in ICD-10.[34] Before 2000, ICD-9 codes were E810 to E819 (with .6 to identify the injured person as a pedal cyclist), E820 to E825 (with .6) and E826.1.[35] Deaths of non-residents of Canada were excluded.

Weighted frequencies and cross-tabulations were used to examine the prevalence of cycling and bicycle helmet use and factors associated with both. For consistency, comparisons between the NPHS and CCHS were limited to respondents aged 12 or older living in the ten provinces. The 2013/2014 prevalence of 3-month bicycle use was age-standardized to an average of the 1994 and 1995 populations to assess whether the change over time was related to the aging population. Regressions that modelled behaviours on helmet use controlled for sex, age, age^2 (to account for the non-linear relationship between age and helmet use) and education. Cyclist fatality rates were age-standardized to the 2012 population. Standard errors and coefficients of variation were estimated using the bootstrap technique to account for survey design effects.

The cross-sectional data preclude an assessment of behaviour changes over time, and therefore, have limited utility for questions about how legislation affects helmet use and ridership. Comparisons between 1994/1995 and 2013/2014 were limited by the NPHS questions, which pertained to past 3-month cycling in the 10 provinces. Respondents were categorized based on residence (population centre or rural), which was not necessarily the area where they cycled. Estimation of a cycling-specific fatality rate is not possible without additional data (for example, number of cyclists, distance cycled, person-trips).

References

1. Garrard J, Rissel C, Bauman A. Health benefits of cycling. In: Pucher J, Buehler R, eds. *City Cycling*. Cambridge, Massachusetts: MIT Press: 2012: 31.
2. Andersen LB, Schnohr P, Schroll M, Hein HO. All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Archives of Internal Medicine* 2000; 160(11): 1621-8.
3. Johan de Hartog J, Boorgaard H, Njiland H, Hoek G. Do the health benefits of cycling outweigh the risks? *Environmental Health Perspectives* 2010; 118(8): 1109-16.
4. Statistics Canada. *CANSIM Table 117-0004*. Distribution of the household population by children's body mass index (BMI) - World Health Organization (WHO) classification system, by sex and age group. CANSIM (database). Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=1170004&pattern=BMI&tabMode=dataTable&srchLan=-1&p1=1&p2=49. Accessed: March 15, 2016.
5. Statistics Canada. *CANSIM Table 117-0005. Distribution of the household population by adult body mass index (BMI) - Health Canada (HC) classification, by sex and age group*. CANSIM (database). Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=1170005&pattern=BMI&tabMode=dataTable&srchLan=-1&p1=1&p2=49. Accessed: March 15, 2016.
6. Office of the Chief Coroner. *Cycling Death Review*. Ontario Ministry of Community Safety and Correctional Services; 2012. Available at: http://www.mcscs.jus.gov.on.ca/english/DeathInvestigations/office_coroner/PublicationsandReports/CyclingDeathReview/DI_Cycling_Death_Review.html. Accessed April 8, 2016.
7. Jacobsen PL, Rutter H. Cycling safety. In: Pucher J, Buehler R, eds. *City Cycling*. Cambridge, Massachusetts: MIT Press, 2012: 31.
8. Transport Canada. Road Safety in Canada (Transport Canada, Catalogue T46-54/1-2011E. ISBN 978-1-100-18621-4) 2011. Available at: http://www.tc.gc.ca/eng/motorvehiclesafety/tp-tp15145-1201.htm#s313
9. Vanlaar WGM, Marcoux K, Robertson R. The road safety monitor 2008: Pedestrians and bicyclists. Ottawa: Traffic Injury Research Foundation (TIRF), 2009. Available at: http://tirf.ca/publications/PDF_publications/RSM_2008_Cyclists_Pedestrians_final.pdf. Accessed: April 18, 2016.
10. Reynolds CCO, Harris MA, Teschke K, et al. The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature. *Environmental Health* 2009; 8(1): 47. doi: 10.1186/1476-069X-8-47.
11. Biegler P, Johnson M. In defence of mandatory bicycle helmet legislation: response to Hooper and Spicer. *Journal of Medical Ethics* 2015; 41(8): 713-7.
12. Hooper C, Spicer J. Liberty or death; don't tread on me. *Journal of Medical Ethics* 2012; 38(6): 338-41.
13. Bicycle Helmet Research Foundation. *Cycle Helmets–An Overview*, 2012. Available at: http://www.cyclehelmets.org/1139.html. Accessed May 4, 2016.
14. Dennis J, Potter B, Ramsay T, Zarychanski R. The effects of provincial bicycle helmet legislation on helmet use and bicycle ridership in Canada. *Injury Prevention* 2010; 16(4): 219-24.
15. Macpherson AK, Parkin PC, To TM. Mandatory helmet legislation and children's exposure to cycling. *Injury Prevention* 2001; 7: 228-30.
16. Newfoundland and Labrador Medical Association (NLMA), Newfoundland and Labrador Public Health Association (NLPHA), Association of Registered Nurses of Newfoundland and Labrador. *Mandatory Bicycle Helmet Use in Newfoundland and Labrador*, 2006. Available at: http://www.nlma.nl.ca/documents/position_papers/position_paper_4.pdf. Accessed April 18, 2016.
17. Hagel BE, Yanchar NL, Canadian Paediatric Society Injury Prevention Committee. Bicycle helmet use in Canada: The need for legislation to reduce the risk of head injury. *Paediatrics and Child Health* 2013; 18(9): 475-80.
18. Goudie R, Page JL. Canadian Academy of Sport and Exercise Medicine position statement: Mandatory use of bicycle helmets. *Clinical Journal of Sport Medicine* 2013; 23: 417-8.
19. Letovsky E, Rowe BH, Friedman SM, et al. CAEP position statement: Improving bicycle safety in Canada. *Canadian Journal of Emergency Medicine* 2014; 17(3): 323-7.
20. Safe Kids Canada. *Safe Kids Canada Position Statement on Bicycle Helmet Legislation*, 2010. Available at: http://www.parachutecanada.org/downloads/policy/Helmet_legislation_position_statement_EN_FINAL.pdf
21. Heesch KC, Giles-Corti B, Turrell G. Cycling for transport and recreation: Associations with socio-economic position, environmental perceptions, and psychological disposition. *Preventive Medicine* 2014; 63: 29-35.
22. Zahran S, Brody SD, Maghelal P, et al. Cycling and walking: Explaining the spatial distribution of. healthy modes of transportation in the United States. *Transportation Research Part D: Transport and Environment* 2008; 13(7): 462-70.
23. Sener IN, Eluru N, Bhat CR. *An Analysis of Bicyclists and Bicycling Characteristics: Who, Why and How Much Are They Bicycling?* Austin, Texas: University of Texas at Austin, 2009.
24. Garrard J, Handy S, Dill J. Women and cycling. In: Pucher J, Buehler R, eds. *City Cycling*. Cambridge, Massachusetts: MIT Press, 2012: 211.
25. Jacobsen PL. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention* 2003; 9(3): 205-9.
26. Teschke K, Koehoorn M, Shen H, et al. Bicycling injury hospitalisation rates in Canadian jurisdictions: analyses examining associations with helmet legislation and mode share. *British Medical Journal Open* 2015; 5: e008052. doi:10.1136/bmjopen-2015008052.
27. Millar WJ, Pless IB. Factors associated with bicycle helmet use. *Health Reports* 1997; 9(2): 31-9.
28. *Transport Canada. Canadian Motor Vehicle Traffic Collision Statistics 2012* (Transport Canada, Catalogue T45-3/2010E-PDF) 2014. Available at: https://www.tc.gc.ca/media/documents/roadsafety/cmvtcs2012_eng.pdf
29. Beck LF, Dellinger AM, O'Neil ME. Motor vehicle crash injury rates by mode of travel, United States: Using exposure-based methods to quantify differences. *American Journal of Epidemiology* 2007; 166(2): 212-8.
30. Finnoff JT, Lasjowski ER, Altman KL, Diehl NN. Barriers to bicycle helmet use. *Pediatrics* 2001; 108(1) e4. doi: 10.1542/peds.108.1.e4.
31. Karkhaneh M, Kalenga J-C, Hagel BE, Rowe BH. Effectiveness of bicycle helmet legislation to increase helmet use: a systematic review. *Injury Prevention* 2006; 12(2): 76-82. *doi: 10.1136/ip.2005.010942.*
32. Gamble T, Walker I. Wearing a bicycle helmet can increase risk taking and sensation seeking in adults. *Psychological Science* 2016; 27(2): 289-94.
33. Bolen JR, Kresnow M, Sacks JJ. Reported bicycle helmet use among adults in the United States. *Archives of Family Medicine* 1998; 7(1): 72-7.
34. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10)*. Geneva: World Health Organization, 1992.
35. World Health Organization. *International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision (ICD-9)*. Geneva: World Health Organization, 1975.